



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|-----------------|-------------|----------------------|---------------------|------------------|
| 09/914,306 | 07/16/2002 | Young Suk Lee | 5204-22 | 2394 |

7590 04/27/2004

Marger Johnson & Mccollom
1030 S W Morrison Street
Portland, OR 97205

EXAMINER

CROWELL, ANNA M

| | |
|----------|--------------|
| ART UNIT | PAPER NUMBER |
|----------|--------------|

1763

DATE MAILED: 04/27/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/914,306

Applicant(s)

LEE ET AL

Examiner

Michelle Crowell

Art Unit

1763

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 24 February 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-10 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-10 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. Claims 1-7, and 10 rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Claims 1, 3, and 5 require “**a diameter of the upper opening is greater than about one third of a diameter of the lower opening** to form a thing film having a uniform thickness. The specification fails to disclose this feature. On page 5, lines 5-11, the specification supports “an opening A having a width of about 70mm to 300mm. for the purpose of achieving uniform density of plasma generated within the chamber”. Furthermore, it is well established that patent drawings do not define the precise proportions of the elements and may not be relied on to show particular sizes (i.e. a diameter of the upper opening is greater than about one third of a diameter of the lower opening) if the specification is completely silent on the issue.

Claim 10 require “**a diameter of the upper opening is about two fifths of a diameter of the lower opening** to form a thing film having a uniform thickness. The specification fails to disclose this feature. On page 5, lines 5-11, the specification supports “an opening A having a width of about 70mm to 300mm. for the purpose of achieving uniform density of plasma generated within the chamber”. Furthermore, it is well established that patent drawings do not define the precise proportions of the elements and may not be relied on to show particular

Art Unit: 1763

sizes (i.e. a diameter of the upper opening is greater than about one third of a diameter of the lower opening) if the specification is completely silent on the issue.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

4. Claims 1, 7, 8, and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hijikata et al. (U.S. 5,254,214) in view of Salimian et al. (U.S. 5,716,485).

Referring to Figure 4, column 4, lined 13-48, and column 5, lines 33-37, Hijikata et al. discloses a semiconductor manufacturing apparatus comprising a chamber 202 having a gas inlet 204 (col. 4, lines 18-20) and a gas outlet 212 (col.4, lines 40-44), the chamber having an upper

Art Unit: 1763

part with a dome configuration (col. 4, line 14); a susceptor 209 provided in the chamber to permit a wafer to be placed thereon (col. 4, lines 63-67); a non-mesh plasma electrode 206 to which RF power 205 is applied to generate a plasma within the chamber (col. 4, lines 20-23); wherein the plasma electrode is of a dome shape to cover the upper part. Additionally, Hijikata et al. discloses applying an RF power of about 500W to 1000W to the plasma electrode (col.3, line 10, col.6, line 17).

Hijikata et al. fails to specifically teach that the plasma electrode is of a truncated dome shape and that the diameter of the upper opening is greater than about one third or about two fifths of a diameter of the lower opening.

Referring to Figures 8 and 16 and column 4, line 46-column 6, line 63, Salimian et al. teaches an apparatus wherein the plasma electrode 90 is of a truncated dome shape in order to control the uniformity of the processing across the wafer (col. 5, line 65-col. 6, line 3, col. 6, lines 48-63, col. 7, lines 36-40). Additionally as shown in Figures 8 and 16, the apex of the truncated dome shaped electrode 90 (corresponds to upper opening) is greater than about one third of or about two fifths a diameter of the base (corresponds to lower opening) of the truncated dome shaped electrode 90. Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to provide the electrode of Hijikata et al. with a truncated dome shape with the diameter of the upper opening is greater than about one third of or about two fifths a diameter of the lower opening as taught by Salimian et al. since this would control the uniformity of the processing across the wafer.

With respect to claim 7, Hijikata et al. discloses that the inner diameter of the electrode gradually becomes smaller from the bottom of the electrode toward the top of thereof (see attached Fig.4).

With respect to the phrase, “ to deposit a thin film having a uniform thickness”, it is considered intended use. Claims directed to an apparatus must be distinguished from the prior art in terms of structure rather than function. Thus, the apparatus of Hijikata et al. in view of Salimian et al. is capable of depositing a thin film having a uniform thickness since Salimian controls the uniformity of processing.

5. Claims 2 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hijikata et al. (U.S. 5,254,214) in view of Salimian et al. (U.S. 5,716,485).

The teachings of Hijikata et al. in view of Salimian et al. have been discussed above.

Hijikata et al. in view of Salimian et al. fail to teach the opening having a width of about 70mm to 300mm.

The apparatus of Hijikata et al. in view of Salimian et al. provides an opening in the upper polar part of the dome electrode and where the only difference between the prior art and the claims was a recitation of relative dimensions of the claimed device and a device having the claimed relative dimensions would not perform differently than the prior art device, the claimed device was not patentably distinct from the prior art device.

Art Unit: 1763

6. Claims 3-4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hijikata et al. (U.S. 5,254,214) in view of Salimian et al. (U.S. 5,716,485) as applied to claims 1 and 7 above, and further in view of Takagi et al. (U.S. 4,539,068).

The teachings of Hijikata et al. in view of Salimian et al. have been discussed above.

Hijikata et al. in view of Salimian et al. fail to teach the gases SiH_4 and NH_3 to form a Si_xN_y thin film having a uniform thickness.

Referring to Figure 3 and column 3, line 64-column 4, line 21, Takagi et al. teaches that it is known to provide a hydrogen containing plasma gases made of SiH_4 and NH_3 to form a silicon nitride film (Si_xN_y thin film) having a uniform thickness. Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to provide the process chamber of Hijikata et al. in view of Salimian et al. with the claimed gases as taught by Takagi et al. since these are known gases used to form silicon nitride thin films.

7. Claims 5-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hijikata et al. (U.S. 5,254,214) in view of Salimian et al. (U.S. 5,716,485) as applied to claims 1 and 7 above, and further in view of Ong et al. (U.S. 5,645,900).

The teachings of Hijikata et al. in view of Salimian et al. have been discussed above.

Hijikata et al. in view of Salimian et al. fail to teach gases CH_4 and H_2 to form a DLC thin film, and SiH_4 , CH_4 , and H_2 to form a SiC thin film.

Referring to column 6, line 35 – column 7, line 6, and line 30 and 47, Ong et al. teaches that it is known to provide a hydrogen containing plasma gases made of CH_4 and H_2 to form a DLC thin film and to mix SiH_4 , CH_4 , and H_2 to form a SiC thin film having uniform thickness.

Art Unit: 1763

Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to provide the process chamber of Hijikata et al. in view of Salimian et al. with claimed gases as taught by Ong et al. since these are known gases used to form a DLC thin film and a SiC thin film.

Response to Arguments

8. Applicant's arguments filed February 24, 2004 have been fully considered but they are not persuasive.

Applicant has argued that Hijikata et al. fails to teach "the electrode having a lower opening and an upper opening, and wherein a diameter of the upper opening is greater than about one third or about two-fifths of a diameter of the lower opening to form a thin film having a uniform thickness". However, the teachings of Hijikata et al. in view of Salimian et al. disclose the above limitation to control process uniformity.

Applicant has argued that in Salimian et al., the diameter of the upper opening is larger than the diameter of the lower opening. However, the teachings of Salimian et al. was applied to show a truncated dome shaped electrode and show that the diameter of the apex of Salimian (which corresponds to applicant's upper opening) is greater than about one third or two fifths of a diameter of the base (which corresponds to applicant's lower opening). The arrangement of Hijikata et al. shows that the diameter of the upper opening is smaller than the lower opening and the Salimian reference displays hole. The Salimian reference was not applied to be bodily incorporated into Hijikata et al.

Art Unit: 1763

Applicant has argued the upper opening is sized to deposit a thin film having a uniform thickness on a wafer. However, claims directed to an apparatus must be distinguished from the prior art in terms of structure rather than function and thus the limitation "to deposit a thin film having a uniform thickness on a wafer" is not given patentable weight.

Conclusion

9. THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michelle Crowell whose telephone number is (571) 272-1432. The examiner can normally be reached on M-F (9:00 - 5:30).

Art Unit: 1763

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gregory Mills can be reached on (571) 272-1439. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

AMC *Amc*
04-22-04

Gregory Mills
GREGORY MILLS
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700